Alberta

WOMEN IN SCIENCE
AND TECHNOLOGY

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The following comments were made by Council member Alice Payne to the full Council in 1991. They are documented here with the agreement of the full Council to emphasize the importance the Council places on addressing these issues.

Page after page of statistics, a stream of books, briefs, papers, speeches and studies...this characterizes the discussion now underway about the importance of increasing the participation of women in science and technology. However, none of these documents has the same impact as a recent advertisement, which simply showed two pairs of bootees, blue and pink, and asked "Guess which one will grow up to be the engineer?".

It is perhaps in the gut reaction to this proposition that the root of the problem is identified: the greatest barriers girls and women face are societal attitudes that engineering, science and technology are professions and subjects of study for men only.

What is the reason for so much concern now? It was not a concern 25 years ago when a woman working in a scientific field was seen as a mere curiosity by many people. I might have ***studied*** geology, but no one seriously expected me to ***work*** at geology.

The concern today is straightforward. More skilled labour is required for Alberta's future economic competitiveness and the science and mathematics skills demanded by a broad range of jobs are increasing. Women are expected to make up the bulk of new entrants to the workforce creating a clear need for changes to attract and retain more women to study and work in all scientific and technological fields.

More than half of the record number of graduates from Alberta's post-secondary institutions each year are women. This is expected to continue throughout the 90's. However, since women are still significantly under-represented in university engineering, engineering technologies and apprenticeship programs, this area continues to need attention.

According to a 1989 report, prepared by Status of Women Canada and Manitoba Women's Directorate:

> "Although governments have implemented a number of initiatives in support of the goal of equality, women remain significantly under-represented in scientific and technological occupations. This inequity prevents women from participating fully and equally in Canadian society in general and the labour force in particular. The under-utilization of the potential contribution of almost half of Canada's labour force constrains our productivity and the ability of Canada to adapt from a resource-intensive to a knowledge-intensive economy. Canada's prosperity in the twenty-first century will be determined by the innovative capacity of all Canadians, particularly in the fields of science and technology."[1]

The implications of this subject were further discussed at a one-day Prairie Region Forum, held in Regina in February 1991, that considered issues relating to women and the study and practice of engineering. One of the speakers at this conference, entitled 'Breaking Barriers and Building Bridges' was Dr. Fred Otto, Dean of the Faculty of Engineering at the University of Alberta who said,

> "A pressing issue for Canada is the critical shortage of ...25,000 to 45,000 engineers predicted by the end of the decade...There are serious implications for Canada's future technological competitiveness if action is not taken...One obvious way of alleviating the potential shortage is to increase the participation rate of women."[2]

There has been some disagreement about the degree of this deficit in engineering personnel in Canada. However, it is not unrealistic to expect significant impact from: a low birth rate since 1970; declining enrolment in engineering and applied

sciences; increasing retirements with an aging workforce; and shrinkage of the immigrant pool traditionally turned to for engineering and science students. Nevertheless, it is unclear to what degree Alberta will face the same crisis. In a submission to the Public Forum (Calgary, February 28, 1992), the Alberta Government's "Toward 2000 Together" program, the Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA) provided statistics which reinforced that Canada is ill-prepared for the future. While Japan has eight engineers per 1,000 people, Canada has only four. However, Alberta has 10 engineers per 1,000 and Calgary 20.

So what has happened? Why has the situation not changed significantly in the last 25 years, despite the emphasis we have placed on education and the prosperity we have experienced? There is increasing evidence that women have historically been discouraged from education and career paths in science and technology by neglect and negative pressure from parents, friends, teachers, counsellors, work environment and society-at-large.[3] Furthermore, many girls have not been encouraged to develop the confidence necessary to undertake science and technology studies and therefore to develop careers through which they can contribute to changing these attitude problems. As a result, females avoid scientific and technical fields perceived as difficult and unrewarding. There are some very successful role models to correct this image, but too few to have sufficient impact.

Dr. Monique Frize, P.Eng., who occupies the Northern Telecom-NSERC Women in Engineering Chair at the University of New Brunswick, initially focussed her efforts on recruiting and retaining women in engineering and enhancing their participation in the profession as well as their presence as faculty in our engineering schools. However, after a short period she changed her mind and said "...it would be unethical to concentrate on the

recruitment part until some of the major problems faced by women in the field are removed."[4]

We must be able to rely on our educational system to ensure that students do not cut off future options by dropping science and technology prerequisites. Without the educational background in mathematics and science, future rewarding career possibilities in science and technology are severely limited. As a result of educational advancement in professions and non-traditional occupations over the past 20 years, women now represent about 50% of the enrolment in medicine, law and commerce. In these fields, women are also well represented in the workplace. But in Canadian engineering, for example, only 13% of students are women (up from 2% in 1970) and only 3% of the engineers in the workplace are female.[5]

Attracting and retaining women means that science has to be perceived as exciting and challenging, that careers in science and technology must appear more attractive, and that the workplace is "user friendly" for women. This will require new attitudes towards women, and realistic, aggressive action to remedy the imbalances and integrate women into the science and technology community. It will also ensure that men, who are taking an increasing role in the home, are not excluded from science and technology careers because of these responsibilities.

Attitudes and behaviours in institutions need to be changed - as one male engineering student said to his university peers:

> "It is your turn to personally take a stand and change the image and the attitude in our profession. It is time for you to change and not accept the dinosaur attitude of prejudging women. This attitude exists at all levels in the profession. It is up to you, the individual."[6]

Along with the change in attitudes, other factors affecting young women at university must be addressed including, for example, reducing isolation, providing more female professors, and

reviewing criteria for tenure to take into account child-bearing periods.

Attracting women to science and technology, and educating them, will all be useless if we do not learn to get rid of negative experiences, to value women's skills, and manage diversity in a work environment. Enhanced productivity, more effective problem solving and improved communications will be the reward. Women's strengths can be business assets: listening and caring, using power in serving others, and facilitating cooperation to reach goals will lead to better problem solving. Success in increasing women's participation will occur if the students' education leads to a workplace which provides equal opportunities for women.[7]

With goodwill and work there will be a culture that will encourage women to participate in science and technology activities. There will be no barriers or obstacles restricting women's educational and career choices in science and technology. A supportive and enabling environment recognizes differences and values the contribution of women. Women will be inspired to play a significant role in all aspects of science and technology, including leadership and management in the science and technology establishment.

Achieving this objective will not be quick and easy. The challenge was aptly stated, in one sentence on a single page between the technical charts, data and diagrams of a petroleum book from Southern Tunisia: "Everyone is trying to accomplish something big, not realizing that life is made up of little things."

To achieve progress in this area the following recommendations were made by the Council:

- It was recommended that measures be introduced to elevate the profile of successful women in science and technology in Alberta by compiling and publishing a "Who's Who" directory of women in science and technology

- It was recommended that support and assistance be provided in coordinating grass roots programs that portray science and technology as interesting and rewarding for females, eliminating stereotyped images of science and technology as a man's field.

Final Comment

Since this paper was delivered to the Alberta Premier's Council on Science and Technology, the Canadian Committee on Women in Engineering published an important report on the social and cultural barriers responsible for the under-representation of women in engineering. This report reinforces the conclusions of the Premier's Council presentation. It presents a series of recommendations designed to bring women into full participation in the profession and identifies six factors critical to making changes:

1. There must be commitment from the top, from senior management in the elementary and secondary school system, universities and workplaces.
2. Real social change will not occur unless everyone understands and accepts that women deserve equal status as people and as engineers. Changing attitudes will take time, but will be accelerated by education and awareness programs that reinforce gender sensitivity.
3. Women must be involved in the process of change, as science and mathematics teachers, as professors and administrators in universities, as senior mangers and company directors and as members of professional councils and committees at the provincial, national and territorial levels.

4. Cooperation is required from all those involved in the making of an engineer: parents, other caregivers, teachers and guidance counsellors; engineering deans, faculty and students; employers of engineers; and associations of professional engineers.

5. Organizations must set realistic and challenging goals for attracting, retaining and advancing the careers of women engineers.

6. Organizations that represent the key stakeholders in the elementary and secondary school system, universities, workplaces and associations of professional engineers must be made responsible for monitoring the implementation of the CCWE's recommendations and strategies.[8]

The study further identifies steps and target dates to achieve the recommendations.

NOTES

1. Status of Women Canada and Manitoba Women's Directorate Participation of Girls and Women in Math, Science and Technology Submitted to the joint meeting of Federal/Provincial/Territorial Ministers Responsible for the Status of Women and Provincial/Territorial Ministers Responsible for Education, Toronto, Ontario, February 21, 1989 p. i.

2. The Pegg (The newsletter of the Association of Professional Engineers, Geologists and Geophysicists of Alberta) April 1991, p. 4.

3. Hacker, Sally L. "The culture of engineering: woman, workplace and machine" in Women, Technology and Innovation edited by Joan Rothschild. Oxford, Pergamon Press, 1982.

4. Frize, Monique Phd. P.Eng. Northern Telecom-NSERC Women in Engineering Chair, University of New Brunswick, "Issues on Women in Engineering: A national overview" (Notes for an address to the Atlantic Region Public Forum, Halifax, Nova Scotia, March 26, 1991) p. 2.

5. The Pegg (The newsletter of the Association of Professional Engineers, Geologists and Geophysicists of Alberta) April 1991, p. 4.

6. Frize, Monique Phd. P.Eng. Northern Telecom-NSERC Women in Engineering Chair, University of New Brunswick, "Issues on Women in Engineering: A national overview" (Notes for an address to the Atlantic Region Public Forum, Halifax, Nova

Scotia, March 26, 1991) p. 5.

7. Menzies, Heather "Back to Grandma's Place: democratizing science and technology" in Canadian Woman Studies vol. 5 no. 4 Summer 1984 p. 59-62

8. Canadian Committee on Women in Engineering "More than just numbers" April 1992 p.3

For more information about the Premier's Council on Science and Technology contact:

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For further information about these issues:

1. The University of Alberta, School of Library and Information Studies has a Women in Pure and Applied Science Bibliography maintained online on the SPIRES (Stanford Public Information Retrieval System) database management system. The November 1991 printing of the Bibliography includes 3464 items. The Bibliography includes printed material in the English language covering women in pure and applied sciences. Earlier printings of the Bibliography included some 'women in medicine' articles. Except for items of historical interest and bibliographies, these have been removed. A number of more general topics could be included since they apply to 'women in science' such as women as professionals, women in nontraditional careers, sex differences, academic women, daycare, dual career families, psychology of women, sociobiology, etc. There are items dealing with these topics in the Bibliography but no effort has been made to cover them comprehensively.

   Information on the database is available from: Sheila Bertram, School of Library and Information Studies, 3-20 Rutherford South, University of Alberta, Edmonton, Alberta, Canada T6G 2J4

2. Statistical information about female graduates from colleges and universities is provided by Industry, Science and Technology Canada, Women in Science and Engineering (vol. 1: Universities, March 1991; vol 2: Colleges, March 1992).

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